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MANITOBA
DEPARTMENT OF NATURAL RESOURCES

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ABSTRACT

A creel census on three stocked trout lakes in the Duck Mountains was carried out from December, 1978 to May, 1982.

Fish harvest from each lake was estimated using a stratified sampling design.

25.4% of fish planted as two year olds were eventually caught by anglers, compared to 7.2% and 7.9% of fingerling and yearling fish, respectively. Brook trout produced a higher return to the creel than rainbow trout did at a given age, and splake appeared to be similar in performance to brook trout. Lowest cost per return was obtained with fingerling splake and it was tentatively concluded that on Gull and Two Mile Lakes, stocking should consist of 0+ splake or brook trout in combination with small numbers of 2+ rainbows in order to provide acceptable quality angling at minimum cost. Because of apparent predation by lake trout, East Blue Lake should either be treated with fish toxicant and restocked or a catch-release fishery should be established.

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INTRODUCTION

From 1979 to 1982, an angler creel census was carried out in five stocked trout waters of the Duck Mountain Provincial Park: East Blue Lake, Gull Lake, Childs Lake, Laurie Lake and Two Mile Lake. The purpose of the census was to evaluate the effectiveness of different trout stocking procedures as measured by angler success and the per centage of stocked fish returned to the angler.

Specific locations creeled in 1979 were Childs, Laurie, Gull and East Blue Lakes. In 1980 and 1981, East Blue, Gull and Two Mile Lakes were creeled, while in 1982, only East Blue Lake was creeled to the end of August, 1982.

This report covers the results obtained from East Blue Lake, Gull Lake and Two Mile Lake.

Study Area

East Blue Lake is situated at the junction of P.R. 366 and P.R. 367 at 21-30-25-W1. It has an area of 90.2 hectares with a maximum depth of 58.9 metres and a mean depth of 21.7 metres. During the creel census, East Blue Lake had rainbow trout, lake trout, brook trout, brown trout, splake and yellow perch present.

The largest, most developed campsite in the Duck Mountain Provincial Park is located adjacent to East Blue Lake along with good boat launch facilities, boat and motor rentals, a store, rental cabins,

beach and playground and privately owned cabins. There are no motor restrictions in place at East Blue Lake.

Gull Lake is situated on 15-30-26-W1, just off P.R. 367, approximately 8 kilometres east of Childs Lake. This is the largest lake of the three study areas with surface area of 116.6 hectares, a maximum depth of 18.9 metres and a mean depth of 7.6 metres. Rainbow trout, splake, brook trout, kokanee and lake whitefish were the species present during the creel census.

There are no camping facilities available at Gull Lake but there is a picnic area cul-de-sac and a small boat launch. There are no motor restrictions on Gull Lake.

The smallest study lake, Two Mile Lake, situated approximately 5 kilometres south of Wellman Lake on P.R. 366 at 27-32-25-W1, has an area of 42.1 hectares, a maximum depth of 19.5 metres and a mean depth of 6.4 metres. Brook trout and white suckers are the major species present in the lake.

There are no camping facilities at Two Mile, but a small boat launch and picnic area is provided. Prior to 1982, there was a complete power boat restriction on Two Mile Lake, but legislation in 1982 opened up the lake to include electric powered motors in addition to human powered boats or canoes.

Methods

Data collection was carried out on Gull and East Blue Lake from

December 1, 1978 to December 31, 1979. No data were collected from January 1, 1980 to April 30, 1980. The census was resumed May 1, 1980 but curtailed from May 21, 1980 to June 3, 1980 and June 10, 1980 to June 27, 1980 due to the park closure caused by extreme fire danger. The census then continued non-stop for East Blue, Gull and Two Mile Lakes until April 30, 1982, excepting East Blue Lake which was creeled until August 31, 1982.

Data collected from the anglers included fork lengths, total weight, an ageing structure and stomach contents from all trout species caught whenever possible. Anglers were also interviewed to determine the number of anglers in their party, their place of residence and the number of hours spent fishing. Whenever possible, anglers were interviewed before they had started fishing and after completion.

Starting in May, 1981, all trout were examined for a phosphorescent dye mark which was sprayed on all fish stocked in 1981. The fish were examined by being held in an enclosed box, and viewed under a hand held, long wave, ultra-violet "black light" (Scientific Marking Materials, #M16).

A standard stratified sampling scheme was used to estimate the total harvest of each species on each lake, similar to that used by Valiant and Smith (M.S. Report 79-58).

The strata were defined as follows: spring (May, June) weekdays; spring (May, June) weekends; summer (July, August, September) weekdays; summer, (July, August, September) weekends; fall (October, November) weekdays; fall (October, November) weekends; early winter

(December) weekdays; early winter (December) weekends; midwinter (January) weekdays; midwinter (January) weekends; lake winter (February, March, April) weekdays; lake winter (February, March, April) weekends.

Otoliths, fin rays, scales, and the different colored dye marks were used to determine fish ages. A birthdate of January 1 was arbitrarily given to all fish to seperate age classes. A detailed stocking history of the creeled lakes from 1978 to 1982 is given in Table 1.

Perch Lake is a small 4.7 hectare Lake with a maximum depth of 19.8 metres and a mean depth of 7.2 metres, located approximately seven kilometers north of East Blue Lake along P.R. 366. Since 1968, Perch Lake has been closed to angling and used to rear brood stock for the fish culture division of the department. Perch Lake was opened to angling in 1982, then prior to stocking, was gill netted until no large trout were thought to remain. The lake was then stocked with 321 brook trout yearlings, 321 splake yearlings and 330 rainbow trout yearlings.

During September and October, 1982, Perch Lake was again gill netted until virtually all fish were caught to determine yearling survival of the three species under little or no angler exploitation.

For the purposes of this report, all fish were given a birthday on Jan. 1 of each year, i.e. the fish were considered a year older once they had spent one year in the lake.

RESULTS

Angler harvest and per cent of stocked fish returned to the angler generally increased with age of the fish stocked, throughout this study. A total of 45,000 0+ fish returned 3,240 fish to the creel (7.2%), 109,770 fish stocked as yearlings returned 8,714 fish to the creel (7.9%) while 22,772 fish stocked as 2 year olds returned 5,781 fish to the creel, an average of 25.4%. Percent return for each cohort stocked is given in Table 2.

There were substantial differences in percentage returns of the different trout species stocked during the census period. In particular, brook trout yielded higher returns than rainbows did when stocked at the same age. 24,270 1+ brook trout returned 4,070 fish to the creel (17%) while 79,000 yearling rainbows returned only 5,478 fish to the creel (7%), 8,730 brook trout planted as 2+ fish returned 2,732 fish to the creel (31%) while 14,042 rainbows planted as 2-year-olds returned only 3049 fish (22%) to the creel.

Stocking records for each lake during the years that the census took place are given in Table 1. Table 8 gives the stocking rate, mean lengths and weights for yearling and two year olds.

Total hours spent angling, total catch per angler-hour and catch per angler-hour by species is given in Table 4.

Place of residence is presented as Manitobans, Saskatchewan residents, Canadians, Americans, others and unknown. Manitoba and

Saskatchewan residents represented the majority of anglers in each instance with Manitobans leading. Figures 3, 4, 5 and 6 show the distribution of the anglers from the number of parties interviewed and Table 6 gives a further breakdown of these figures.

The total catch by gill nets in Perch Lake during 1982 is given in Table 9. An estimate of the number of trout eaten by loons in Perch Lake in 1982 is given in Table 7. The average number of trout eaten by each loon per day (3 trout) is based on observations made at East Blue Lake during 1982 (Shelly Matkowski, unpublished data, 1982).

The growth rates of the stocked fish in this study were good. Figure 7 shows the growth rates of three species of trout stocked in Gull Lake.

DISCUSSION

One of the main reasons for the lower returns of younger fish appears to be predation by birds, specifically loons, mergansers and blue herons: Shelly Matkowski (unpublished data, 1982) estimated that loons hunting for food in Perch Lake in 1982, (Table 3), had taken 631 (64%) of the 972 yearling trout stocked that spring. This estimate is remarkably similar to the 635 fish that were missing when the survivors were removed from the lake in October and November, 1982. During the summer, shoreline observations and snorkeling revealed no other sources of mortality for the stocked trout other than piscivorous birds. The estimated trout harvest by loons in East Blue Lake in 1982 was 3454 fish or 35% of all yearling trout stocked that year.

Part of the reason for the apparent difference between brook trout and rainbow trout may be that the greater susceptibility of brook trout to angling probably results in more of the brook trout ending up in the creel compared to rainbows. It also appears, however, that brook trout and splake as well, are simply less subject to bird predation than rainbow trout are. When the fish in Perch Lake were removed, a total of 137 brook trout, 171 splake and only 29 rainbow trout were caught.

Significantly fewer yearling rainbows survived the summer compared to the other two species and it seems likely that because the rainbows occupy shallower, warmer water than the splake or brook trout do, that they are more susceptible to bird predation.

When costs of stocking are taken into consideration, performance of the different species and ages of trout used changed dramatically compared to an evaluation based on return to the angler alone: costs of raising the fish no doubt vary from one year to another, but using figures for the Whiteshell Hatchery of $0.03 each for fingerlings, $0.50 each for yearling fish and $2.50 for 2+ fish (Dr. J. O'Connor, personal communication), and given the average percentage returns found in this study, the cost to the public for each 0+ splake creeled was $0.42, 1+ brooks were $3.09. 1+ rainbows were $10.78, 2+ brooks were $8.21 and 2+ rainbows were $13.19 each.

No significance tests or estimates of precision were made to compare these cost figures, but it appears that 0+ splake were significantly less expensive to use than any of the other species/age combinations, and 1+ brook trout were next lowest in cost. The 2+ fish, however, were more consistent in performance than the younger fish were. Costs per return varied from $7.16 - $9.25 for 2+ brooks and from $9.27 - $17.10 for 2+ rainbows, but ranged from $1.48 - $16.13 for 1+ brooks, from $2.41 - $24.39 for 1+ rainbows and from $0.35 - $17.65 for 0+ splake.

The above comparisons were made using the data from all three lakes and all cohorts stocked, only excluding a few cohorts for which data were incomplete due to termination of the census. There are two complicating factors, however, which should be kept in mind when interpreting the results: first, the best performance obtained from 1+ rainbows was in Gull Lake in 1981, when 21% of the fish planted were returned to the creel, at a cost per return of approximately $2.41.

This return was exceptionally high and was due to an apparent shift in the type of angler using Gull Lake in 1981. As pressure on the lake increased, the number of casual anglers who were prepared to keep 6" - 7" rainbows seemed to increase very rapidly. These fish were not kept to the same extent in other years and would probably not have shown up in the creel in 1981 except for the splake and 2+ rainbows present in Gull that year, which attracted the large numbers of anglers.

Second, since poorer performance was obtained with all cohorts in East Blue than in the other two lakes, and since East Blue may have a complicating factor present in the form of lake trout, there is some justification for examing costs for this lake separately from those obtained from Gull and Two Mile.

If the same cost comparisons are made for Two Mile and Gull only and excluding the 1981 1+ rainbows in Gull, the results are somewhat different: costs per return (range in parentheses) become $0.33 ($0.29 - $0.39) for 0+ splake, $3.00 ($1.48 - $4.31) for 1+ brooks, $12.00 ($4.41 - $24.39) for 1+ rainbows, $8.00 ($7.00 - 9.00) for 2+ brooks and $9.00 (no range) for 2+ rainbows.

Costs on East Blue were $17.65 per return for 0+ splake, $33.05 for 1+ splake, $16.13 for 1+ brooks, $6.61 for 1+ rainbows, $17.10 for 2+ rainbows and $5.35 for the 1+ browns stocked in the fall of 1979. Clearly, the splake and brook trout performed very poorly in this lake; a likely explanation is that while these species outperform rainbow trout on lakes in which bird predation is the only major source of

mortality aside form angling, these are probably more susceptible to predation by lake trout and consequently did not even do as well as 1+ rainbows on East Blue.

No direct evidence was obtained on East Blue Lake to support the hypothesis of predation by lake trout, but performance of fish planted in this lake was substantially poorer than in the other waters studied, for most cohorts, and the presence of lake trout is the most noticeable difference between East Blue and the other lakes. In support of this argument, Glad Lake is very similar to East Blue in terms of water quality and morphometry and, like East Blue, appears to be high quality trout habitat. Glad has a small lake trout population and also some pike and walleye, and twenty-five years of trout stocking in Glad gave consistently poor results, according to available evidence. After most of the predators were removed using gill nets in 1980 and 1981, a subsequent planting of brook trout was more successful.

The cost per fish returned is definitely not the only criterion that should be used in deciding on a stocking program for these lakes. Angler expectations and angler acceptance of the various species and sizes of fish must also be taken into consideration. In these terms, both rainbow trout and splake have an advantage over brook trout since they grow to a larger size, and rainbow trout are probably held in higher esteem by more anglers than the other two species, in particular by dry fly fishermen.

In addition, the range of costs per return for a given species/age of fish is perhaps as important as the average cost itself. Specifically the performance of 1+ rainbows was very erratic during the study, with returns of the different cohorts in Gull Lake ranging from 2% to over 20%. It is desir able for a number of reasons to be able to provide reasonably consistent quality angling from one year to the next, and this does not appear to be possible with 1+ rainbows, at least with the stocking rates used in the study.

Stocking rates ranged from 111 to 172 0+ fish per hectare from 43 to 475 1+ fish per hectare and from 67 to 112 2+ fish per hectare.

The majority of anglers seemed to be satisfied with a success level of approximately 0.3 fish per hour and annual angling pressure on Gull and Two Mile was in the vicinity of 200 hours per hectare (80 hours per acre) at this level of success (Table 4). Assuming that 0.3 fish per hour is a reasonable target for management of these waters, then Gull Lake will have to produce 6,900 fish, Two Mile will have to produce 2500 fish and East Blue will have to produce 5,400 fish annually. In Gull and Two Mile these quantities of fish could probably be obtained by stocking 650 0+ splake or 350 1+ brook trout or 225 2+ rainbows per hectare, at costs of $30, $175 and $560 per hectare, respectively.

If the cost figures used here are valid, then there can be little doubt that the bulk of the fish stocked each year in these two lakes should be 0+ splake, or perhaps 0+ brook trout assuming that their

performance would be similar 2+ rainbow planting should also be maintained due to the demand for this species, but stocking rates should be fairly low in order to keep costs down. A combination of 600 0+ splake or brook trout and 15 2+ rainbows per hectare would cost approximately $55 per hectare and seems to be a reasonable compromise between costs and angler demand for rainbow trout.

The above argument assumes that growth rates would remain unchanged: one possible problem with this approach is that by stocking greatly increased numbers of 0+ fish and few 1+ and 2+ fish, it would be necessary for the fish to grow more in the lake before reaching a catchable size, and this additional demand might exceed the lake's capability to produce.

The stocking rates used in this study did not appear to adversly affect growth rates of the different species of fish. Table 5 shows that the growth of trout in Gull Lake was equal to or exceeded the growth of trout as reported by Fraser (1980) and Crossman (1973).

East Blue Lake presents a more difficult problem to solve because of the poor performance of all ages and species of fish planted during this study. Harvest could probably be brought up to an acceptable level by stocking 40,000 2+ rainbows annually, although this would appear to be a costly solution. A second and probably cheaper alternative would be to poison this lake out to bring its performance more in line with Gull and Two Mile. A third possibility would be to manage this

lake in a different manner, specifically to establish a catch and release fishery or a low possession limit fishery directed towards keeping larger fish in the water for a longer period of time. In 1981, 700 surplus 4+ rainbows were stocked in East Blue and these fish caused a dramatic increase in angling pressure and success. With the existing limit of six fish daily, however, virtually all of this cohort was caught within four weeks. In hindsight, the amount of recreation realized from this particular cohort could have been greatly increased with a lower possession limit, although to maintain an acceptable level of angling success on a long term basis, the possession limit would probably have to be much lower than one fish daily.

A fourth possibility for East Blue is use of a different species, such as kokanees (*Oncorhynchus nerka*). Kokanees have been stocked in four other Duck Mountain Lakes, Childs, Laurie, Gull and Beautiful, with excellent results in some cases. 90,000 kokanee fry were stocked in Laurie Lake in 1975 and during the winter of 1978-79 an estimated 2,500 (2.8%) of these fish were caught, with angler success during December 1978 at 2.07 fish per hour. Total catch of this cohort is not known, but observations made the previous winter suggest that catches were even higher that year. Success was also good during the summers of 1977 and 1978, according to available evidence, so it appears that the percentage return of this cohort was quite high.

Performance of kokanees in Gull was similar; 60,000 kokanee fry were stocked in Gull in 1975 and from December, 1978 through November 1979 an estimated 2,500 (4.2%) of them were caught, with angler success

during this period as high as 2.9 fish per hour in December 1978 and averaging 0.13 kokanees per hour from May to September 1979, after most of them had presumably died after attempting to spawn.

Conclusions and Recommendations

1. Yearling rainbow stocking has been a waste of money on these lakes. Returns have been erratic and generally low.

   2+ rainbows were more consistent and provided higher returns than yearlings did. Average costs per return were comparable but given their better performance and the demand for this species by anglers, age 2+ appears to be the best age to stock.

2. Yearling and 2+ brook trout provided higher returns than rainbows of the same age. Yearling brook trout performed well enough that they are probably preferable to 2+ brook trout because of cost.

3. 0+ splake were returned to the angler at the lowest cost of any age class or species used in this study. 0+ brook trout were not stocked, but it is probably reasonable to assume that performance of 0+ brooks would be similar to 0+ splake.

4. It appears that on lakes like Gull and Two Mile, increased use of 0+ splake and probably 0+ brook trout in combination with low level 2+ rainbow stocking would probably provide angling which is good enough to meet present demand, at lower cost. This is assuming that growth rates did not decline.

5. Predation by lake trout seems to be a problem on East Blue Lake. 0+ splake and 1+ brook trout did not even perform as well as 1+ rainbows on East Blue and stocking of these species at age 0+ or 1+ in this lake is not recommended.

   In order to provide reasonably good angling on East Blue, it may be necessary to either poison the lake out and restock it or establish

a catch-release or restricted limit fishery in order to maintain an adequate number of catchable-sized fish in the lake.

6. Kokanee stocked as fry in Gull and Laurie Lake in 1975 out-performed any of the species used in this study. Kokanees may be a third alternative as an inexpensive solution on lakes such as East Blue and Glad.

7. Fall stocking, particularly of rainbows, should be investigated further as a means of reducing bird predation.

Figure 1. Park facilities.

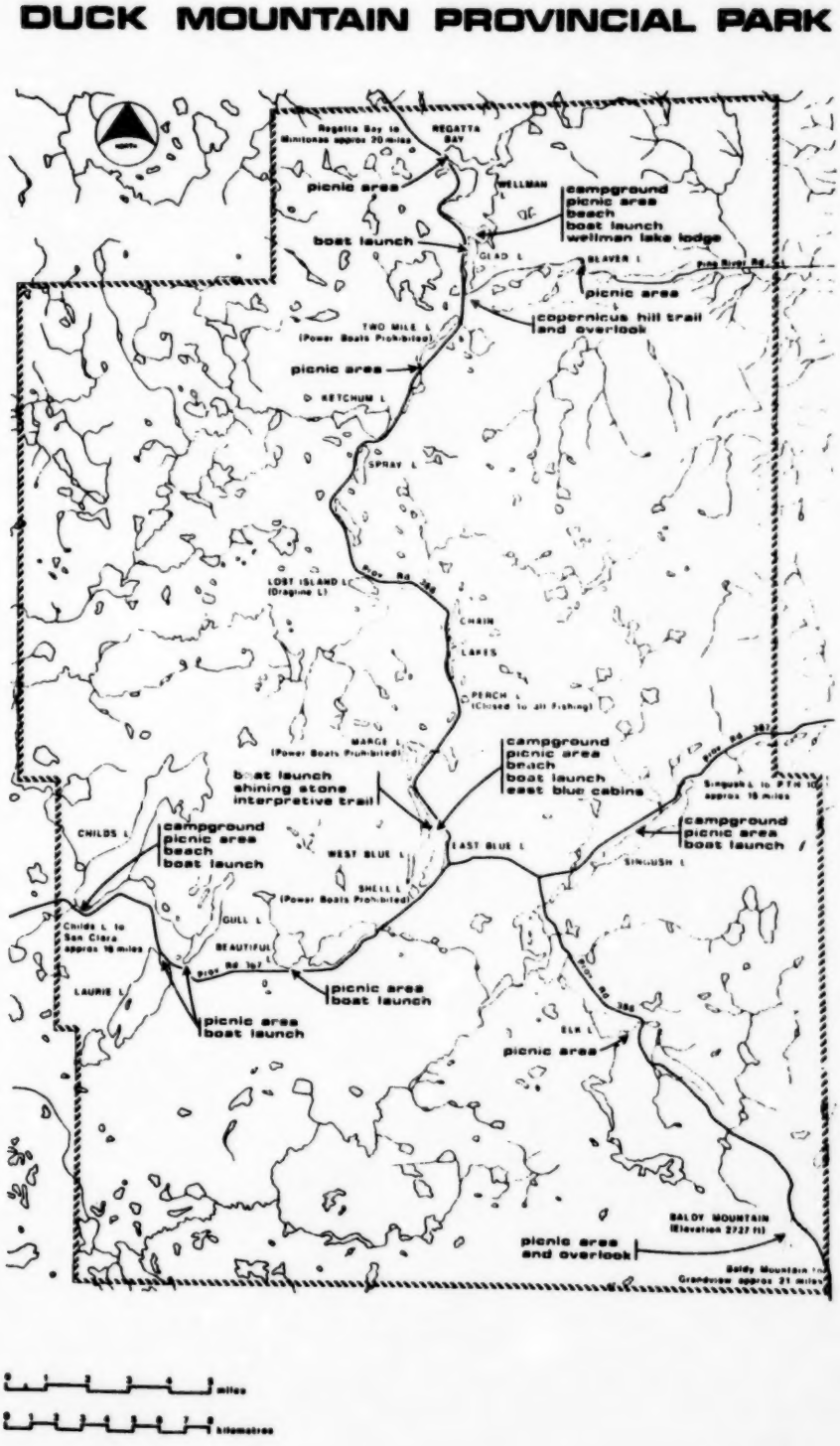


Figure 2. Stocked trout lakes in Duck Mountain Park.

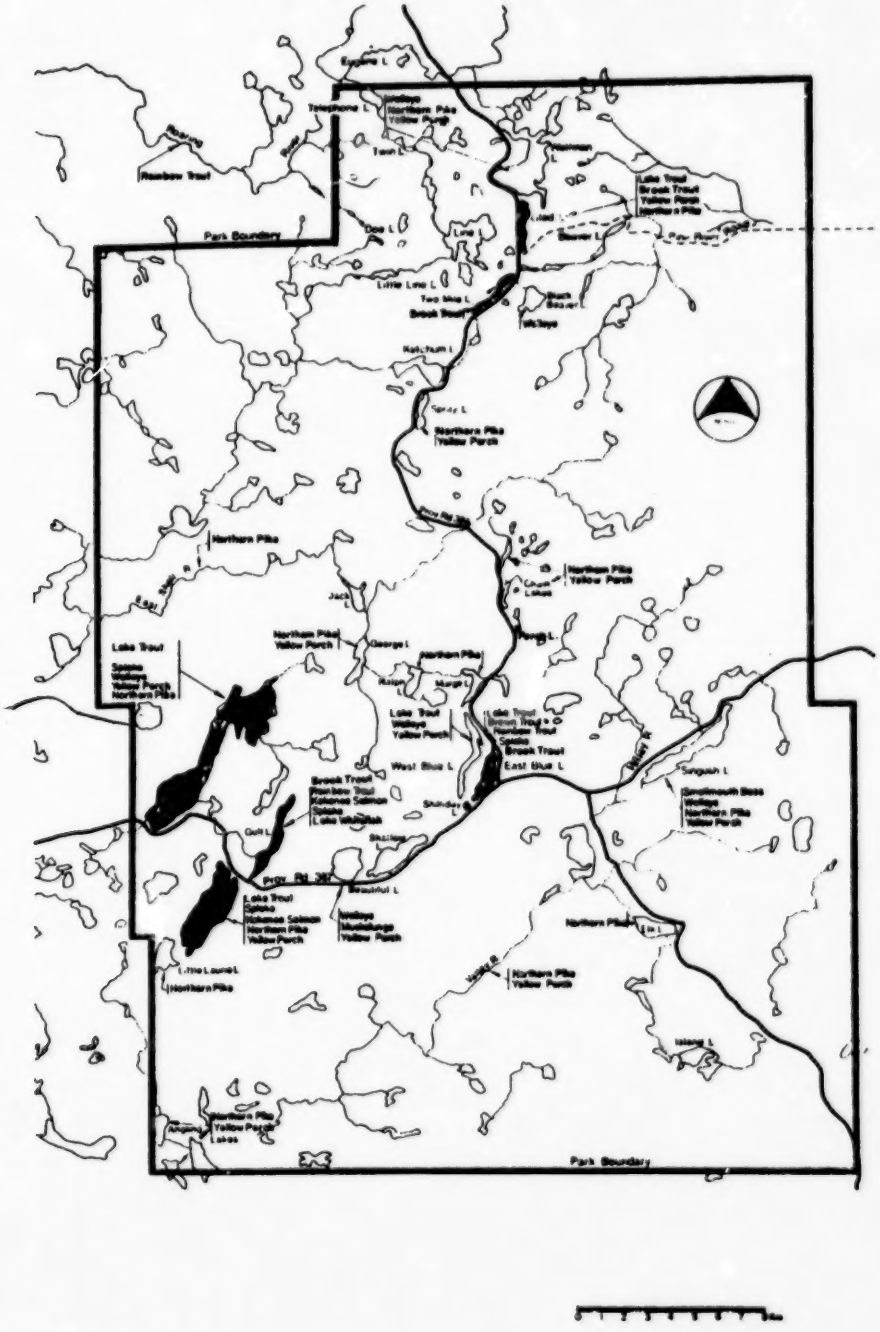
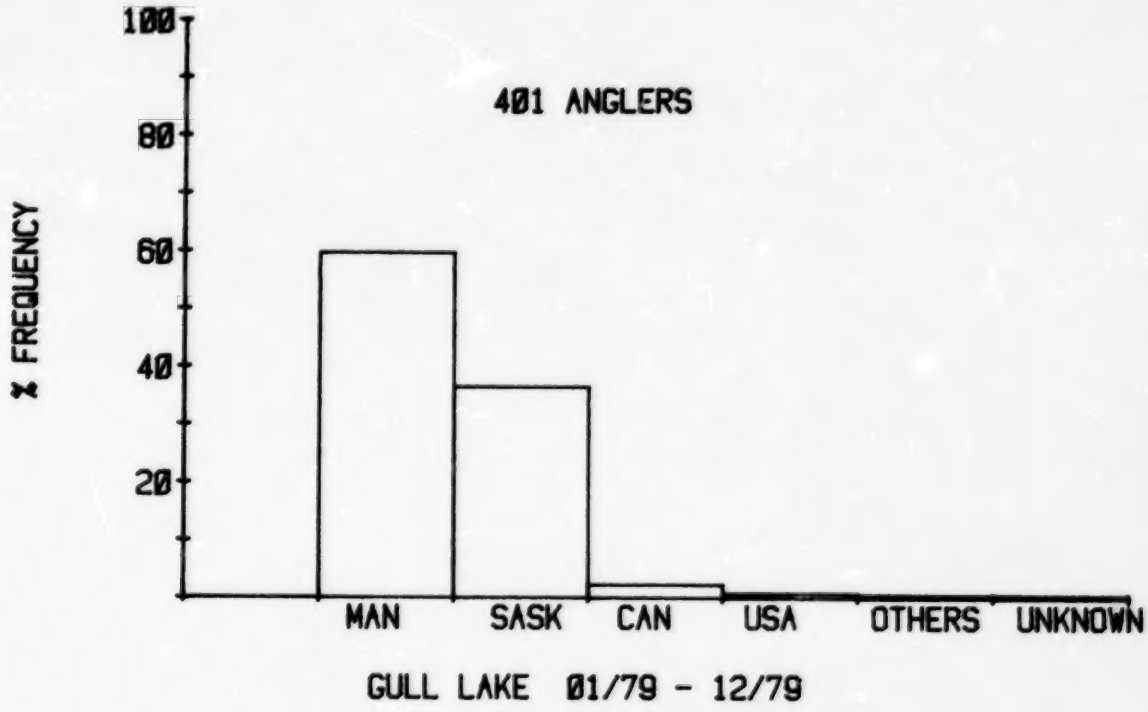


Figure 3. Angler place of residence.



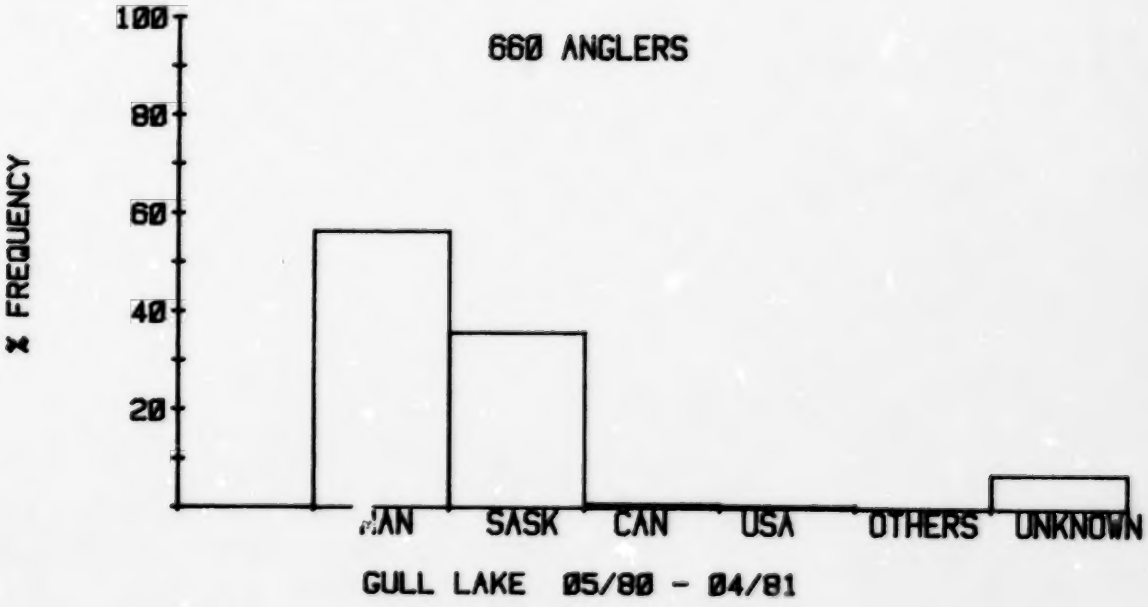
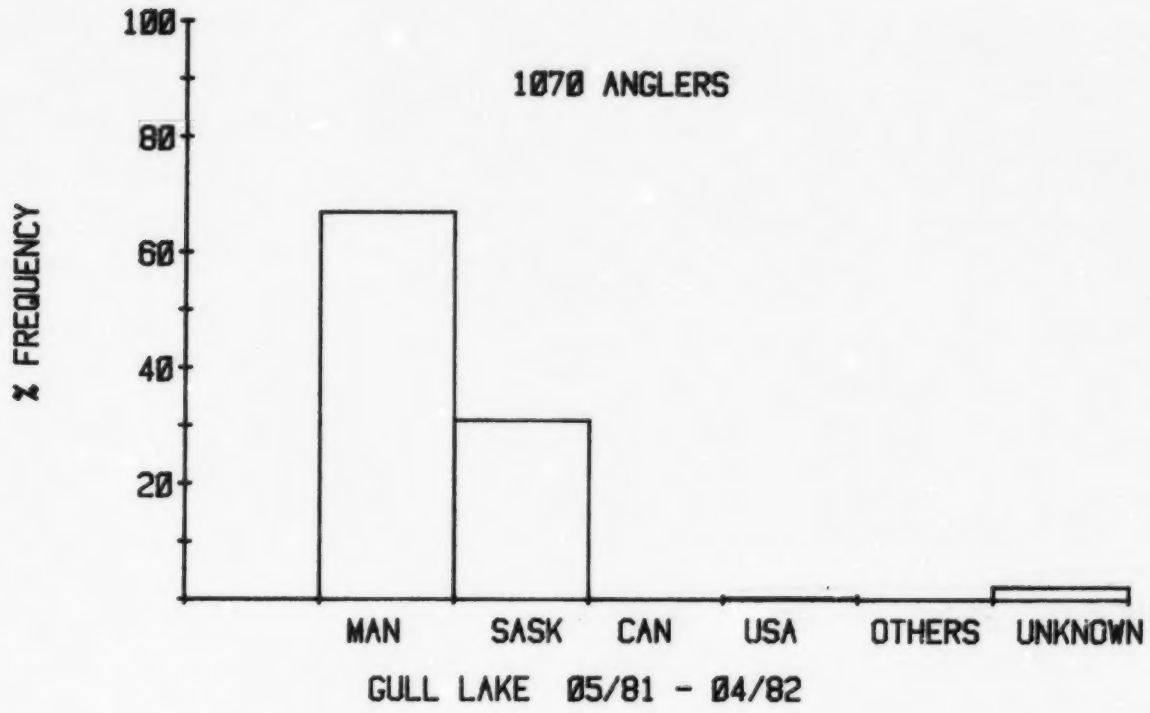


Figure 4. Angler place of residence.



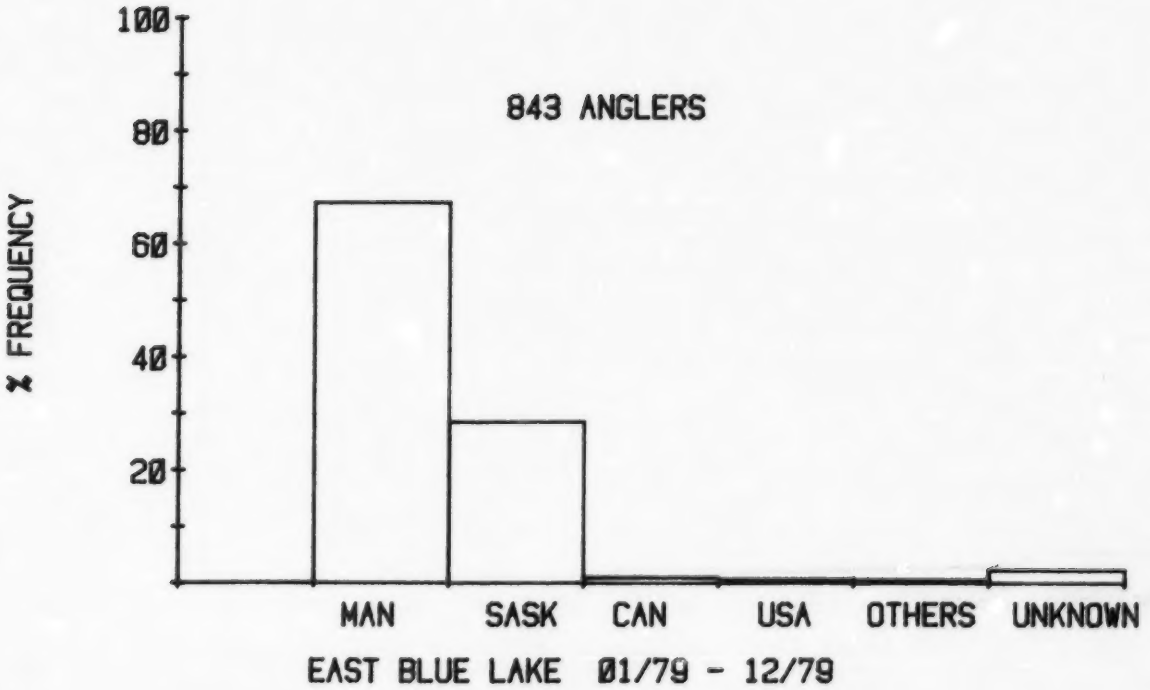
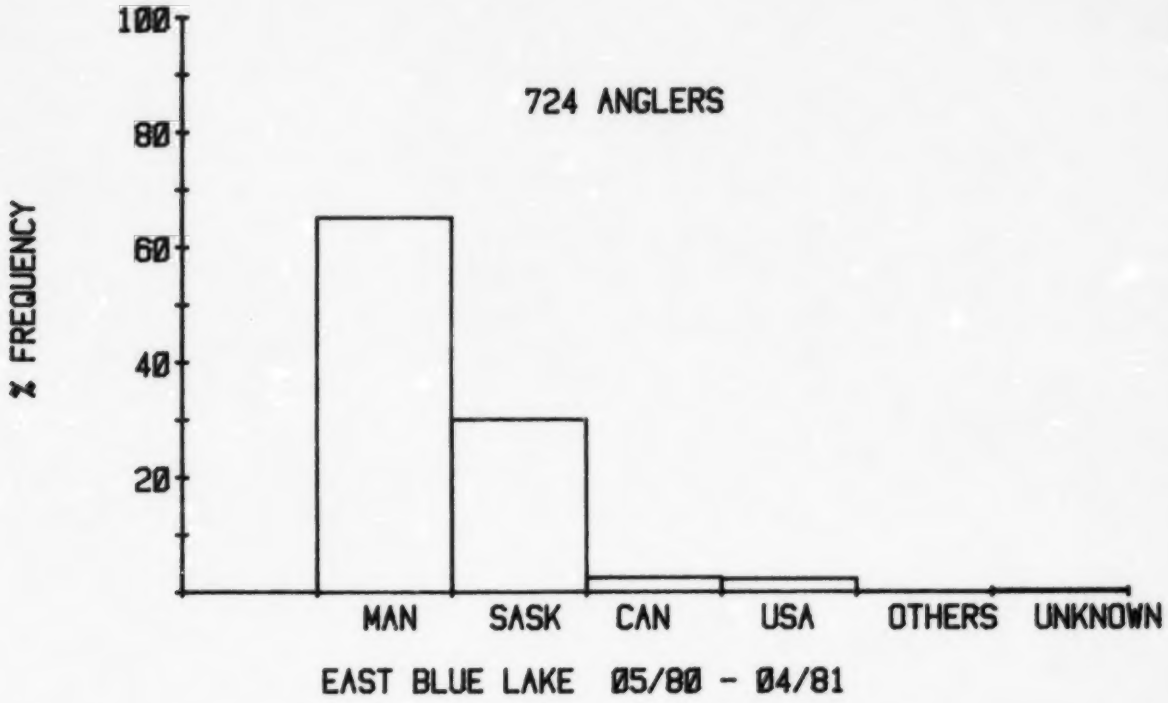


Figure 5. Angler place of residence.



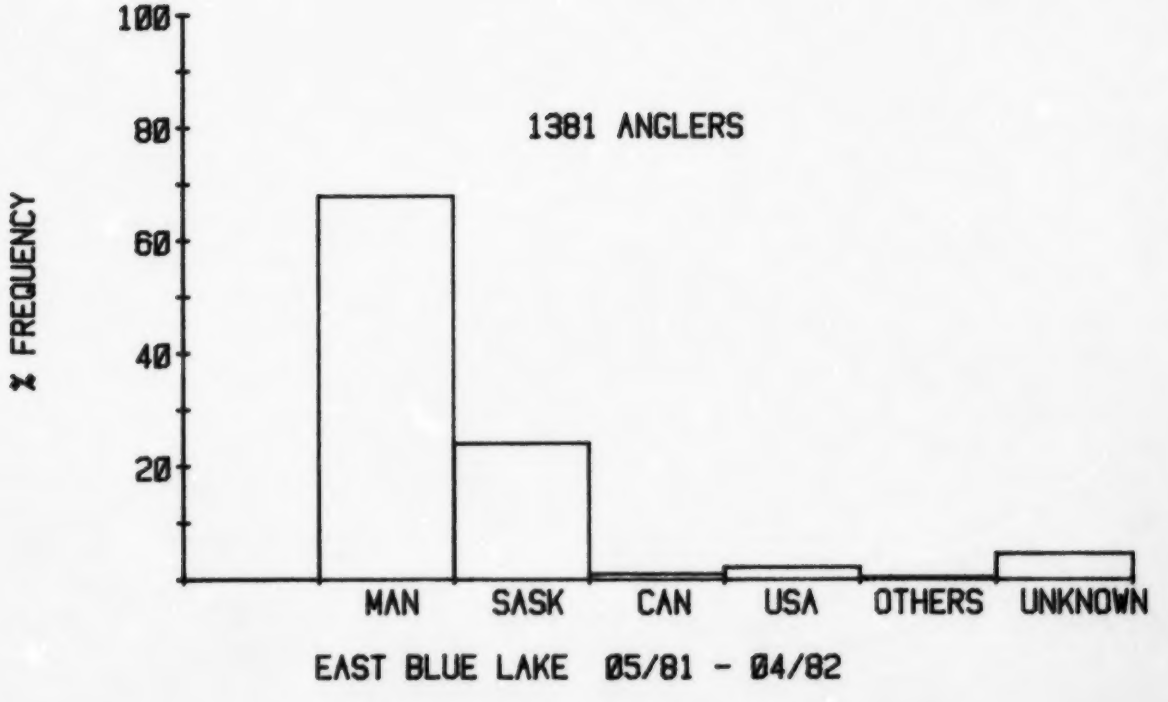
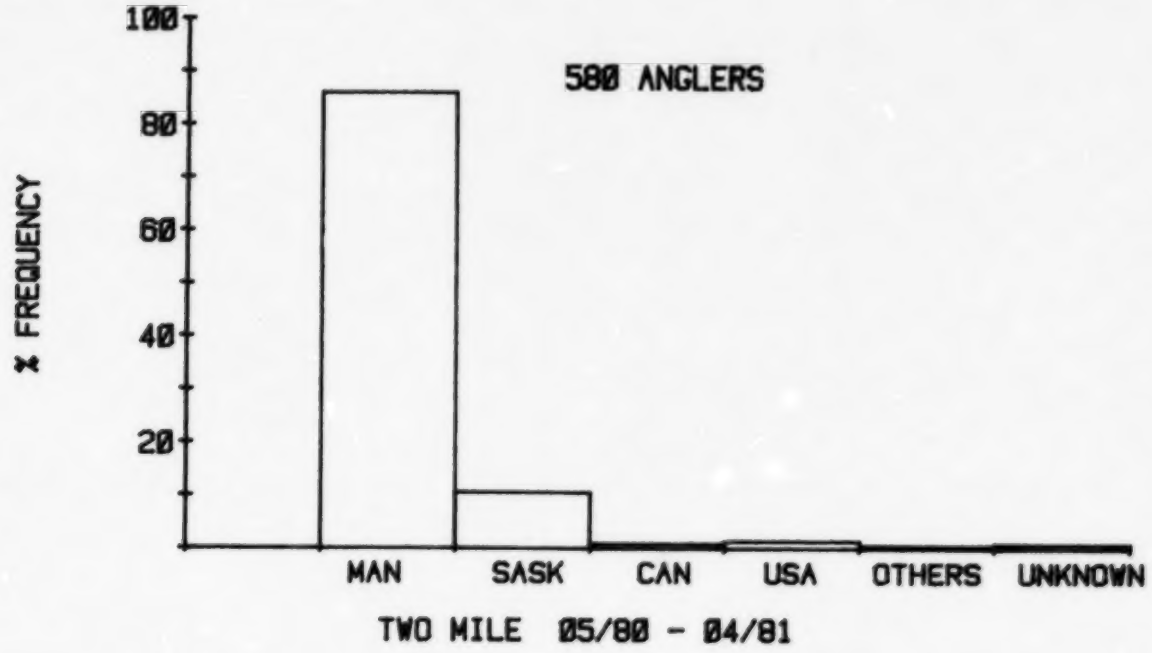


Figure 6. Angler place of residence.



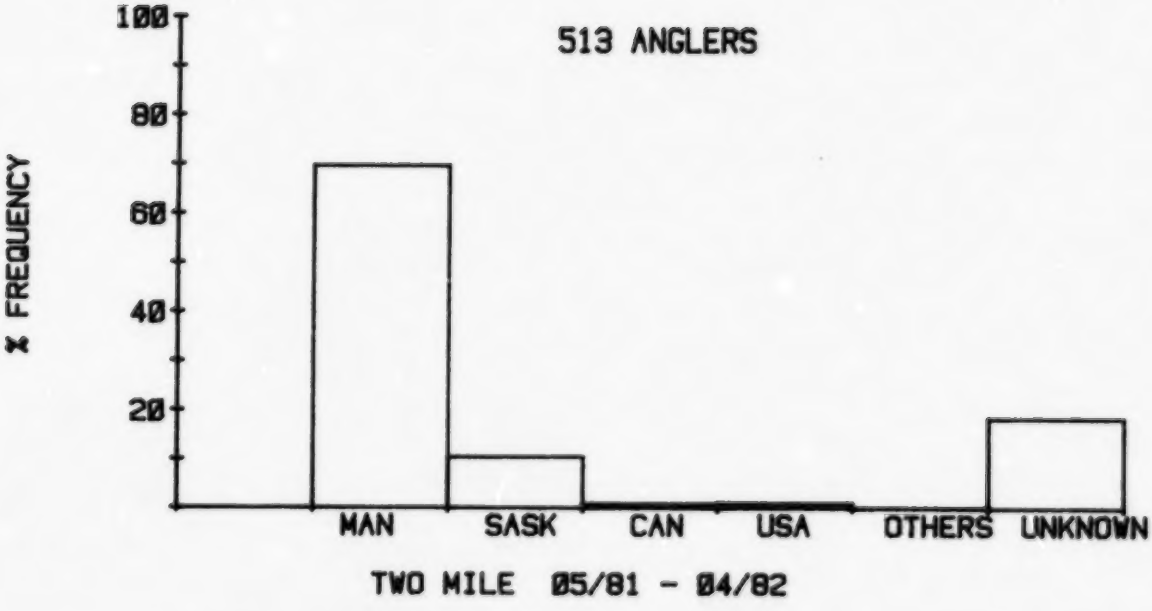


Figure 7. Seasonal growth of Gull Lake trout.

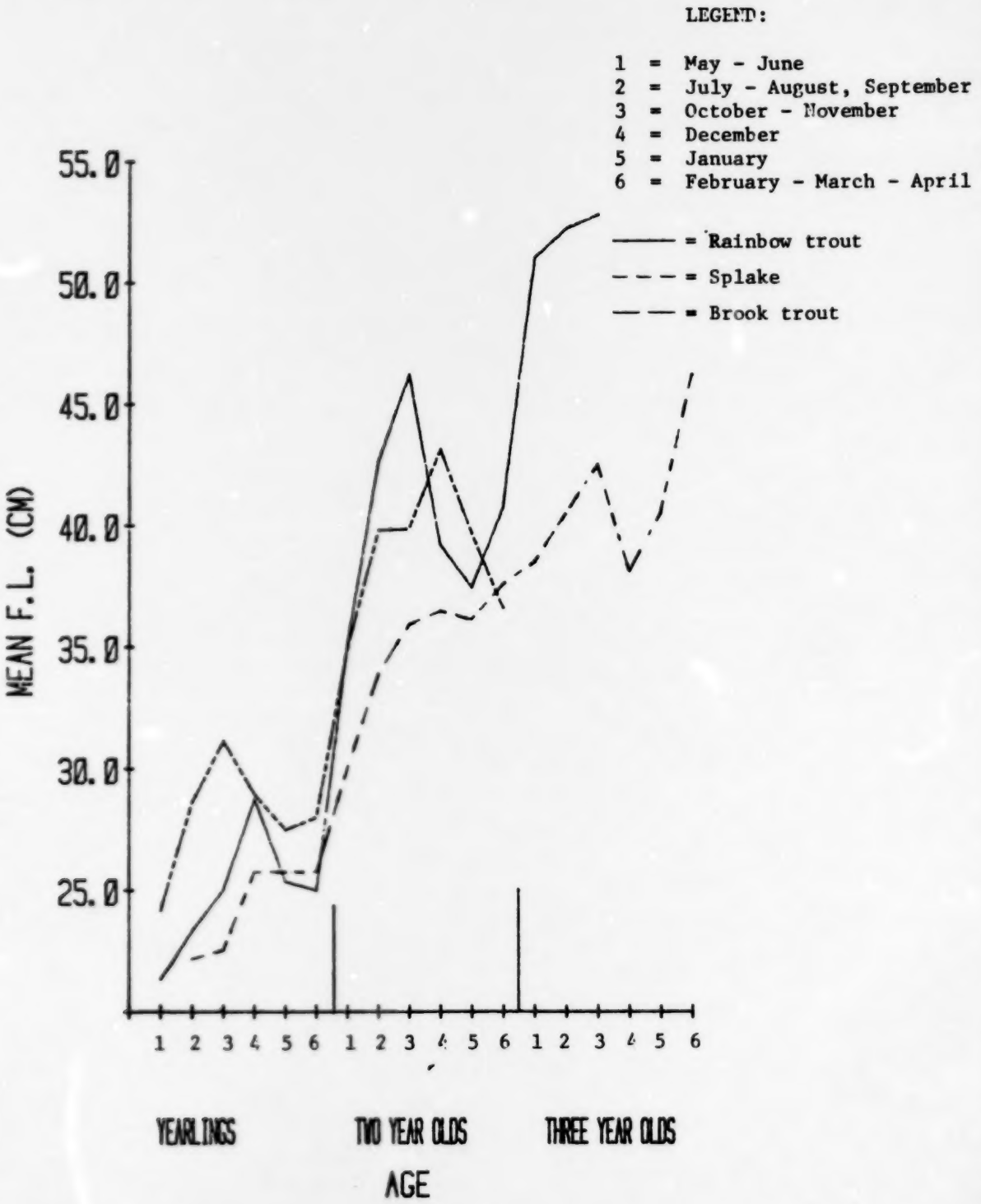


Table 1. Duck Mountains creel census lakes stocking history.

Lake	Year	Species	Age stocked	No. stocked
East Blue	1974	Lake Tr	1+	5000
		Brook Tr	1+	3000
		Rainbow Tr	2+	5000
		Splake	2+	3000
	1975	Lake Tr	1+	4000
		Splake	1+	8000
		Rainbow Tr	2+	12000
	1976	Lake Tr	1+	2000
	1977	Nil		
	1978	Rainbow Tr	1+	20000
	1979	Rainbow Tr	1+	4000
		Brook Tr	1+	4000
		Brown Tr	1+	5000
		Splake	0+	10000
	1980	Rainbow Tr	1+	16000
	1981	Rainbow Tr	1+	5000 (spring)
		Rainbow Tr	1+	6000 (fall)
		Splake	1+	11500
		Rainbow Tr	2+	6000
	1982	Brown Tr	1+	2000
		Splake	1+	8000
Gull Lake	1975	Kokanee	0+	60000
		Rainbow Tr	2+	4000
		Splake	1+	5000
	1976	Nil		
	1977	Nil		
	1978	Rainbow Tr	1+	5000
	1979	Rainbow Tr	1+	6000
		Splake	0+	15000
	1980	Rainbow Tr	1+	18000
		Splake	0+	20000
	1981	Rainbow Tr	1+	5000 (spring)
		Rainbow Tr	1+	6000 (fall)
		Splake	1+	10000
		Rainbow Tr	2+	8042
Two Mile	1974	Brook Tr	1+	5000
	1975	Brook Tr	1+	4000
	1976	Nil		
	1977	Nil		
	1978	Brook Tr	1+	20000
	1979	Nil		
	1980	Brook Tr	1+	9270
		Brook Tr	2+	4730
	1981	Brook Tr	1+	5000
		Brook Tr	2+	4000

Table 2. Angler harvest by species by year.

Lake	Species/age	Stocking year	Number stocked	Area (ha.)	Stocking Rate (#/ha)	Number caught as 0+	1+	2+	3+	4+	Total caught	Total % return to fishery
Two Hills	Brook Tr 1+	1978	20,000	43.1	475.0		1978 a	1979 a	1980 650 (3.25)	0 (0.00)	650 b	3.25
	Brook Tr 1+	1980	9,270	43.1	220.2		1980 825 (8.90)	1981 509 (5.49)			1334	14.39
	Brook Tr 1+	1981	5,000	43.1	118.8		1981 580 (11.60)				580 b	11.60
	Brook Tr 2+	1980	4,730	43.1	112.3			1980 1575 (33.30)	1981 76 (1.61)		1651	34.90
	Brook Tr 2+	1981	4,000	43.1	95.0			1981 1081 (27.03)			1081 b	27.03
East Elue	Brook Tr 1+	1979	4,000	90.2	44.4		1979 22 (0.55)	1980 75 (1.88)	1981 27 (0.68)	1982 0 (0.00)	124	3.10
Gull	Brook Tr 1+	1979	6,000	116.6	51.5		1979 352 (5.87)	1980 1374 (22.90)	1981 306 (5.10)		2032	33.87
East Elue	Rainbow Tr 1+	1978	20,000	90.2	221.7		1978 a	1979 2037 (10.19)	1980 233 (1.17)	1981 0 (0.00)	2270 b	11.35
	Rainbow Tr 1+	1979	4,000	90.2	44.4		1979 10 (0.25)	1980 140 (3.50)	1981 24 (0.60)	1982 50 (1.25)	224	5.60
	Rainbow Tr 1+	1980	16,000	90.2	177.4		1980 75 (0.47)	1981 86 (0.54)	1982 434 (2.85)		595	3.66
	Rainbow Tr 1+	1981	5,000	90.2	55.4		1981 213 (4.26)	1982 112 (2.24)			325	6.50
	Rainbow Tr 2+	1981	6,000	90.2	66.5			1981 775 (12.92)	1982 102 (1.7)		877	14.62
Gull	Rainbow Tr 1+	1978	5,000	116.6	43.9		1978 a	1979 317 (10.34)	1980 135 (2.50)	1981 25 (0.50)	667	13.34
	Rainbow Tr 1+	1979	6,000	116.6	51.5		1979 14 (0.23)	1980 77 (1.28)	1981 52 (0.87)		143	2.38
	Rainbow Tr 1+	1980	18,000	116.6	154.4		1980 116 (0.81)	1981 223 (1.24)			389	2.05
	Rainbow Tr 1+	1981	5,000	116.6	42.9		1981 1039 (23.78)				1039 b	20.78
	Rainbow Tr 2+	1981	8,043	116.6	69			1981 2172 (26.97)			2172 b	26.79
East Elue	Splake 0+	1979	10,000	90.2	110.9	1979 0 (0.00)	1980 0 (0.00)	1981 13 (0.13)	1982 4 (0.04)		17	0.17
	Splake 1+	1981	11,500	90.2	127.5		1981 174 (1.51)	1982 0 (0.00)			174	1.51
	Splake 1+	1982	8,000	90.2	88.7		1982 0 (0.00)				0 b	0.00
Gull	Splake 0+	1979	15,000	116.6	128.6	1979 50 (0.33)	1980 535 (3.57)	1981 575 (3.83)			1160	7.73
	Splake 0+	1980	30,000	116.6	171.5	1980 57 (0.79)	1981 2006 (10.03)				2063 b	10.32
	Splake 1+	1981	10,000	116.6	85.8		1981 253 (2.53)				253 b	2.53
East Elue	Brown Tr 1+ (fall stocking)	1979	5,000	116.6	55.4		1979 0 (0.00)	1980 353 (7.06)	1981 102 (2.04)	1982 12 (0.24)	467	9.34

a = Unknown number taken last year in lake.
b = Census not complete enough to give true final total.

Table 3. Perch Lake netting results - 1982.

Species	# stocked	# caught	% returned
Brook Trout	321	137	42.68
Splake	321	171	53.27
Rainbow Trout	330	29	8.79

Table 4. Creel census lakes angler success.

Lake	Period	Angler hours	Rainbow Tr. # of fish	Rainbow Tr. #/a-h	Brook Tr. # of fish	Brook Tr. #/a-h	Splake # of fish	Splake #/a-h	Brown Tr. # of fish	Brown Tr. #/a-h	Lake Tr. # of fish	Lake Tr. #/a-h	Kokanee # of fish	Kokanee #/a-h	All species # of fish	All species #/a-h
East Blue	78/12-79/12	18548	2134	0.12	22	0.00	8	0.00	80	0.00	359	0.02	—	—	2603	0.14
	80/05-81/04	12466	474	0.04	74	0.01	9	0.00	355	0.03	162	0.01	—	—	1074	0.09
	81/05-82/04	19688	1729	0.09	27	0.00	200	0.01	103	0.01	83	0.00	—	—	2142	0.11
	82/05-82/08	13850	596	0.04	0	0.00	230	0.02	12	0.00	61	0.00	—	—	899	0.06
Gull	78/12-79/12	8400	581	0.07	353	0.04	83	0.01	—	—	—	—			1017	0.14●
									—	—	—	—	2631	0.28	3378	0.40
	80/05-81/04	13582	397	0.03	1373	0.10	584	0.04	—	—	—	—			2354	0.17●
									—	—	—	—	54	0.00	2408	0.18
	81/05-82/04	21462	3545	0.17	305	0.01	2766	0.13	—	—	—	—			6613	0.31●
									—	—	—	—	17	0.00	6616	0.31
Two Mile	80/05-81/04	7634	—	—	2956	0.39	—	—	—	—	—	—	—	—	2956	0.39
	81/05-82/04	7104	—	—	2178	0.31	—	—	—	—	—	—	—	—	2178	0.31

● - Success and catch not including kokanee salmon.

Table 5. Growth comparisons of Rainbow Trout, Brook Trout and Splake.

Species	Lake	Age 1+	Age 2+	Age 3+	
Brook Tr	Gull	22.2	30.9	38.5	Fraser (1980)
	Rumley	15.4	34.4	38.3	
	Chipmunk	15.4	28.9	34.7	
	Shallnot	15.4	37.0	38.5	
Splake	Gull	28.3	37.0		
	Rumley	13.0	27.9		
	Chipmunk	13.0	25.9		
	Presto	13.0	19.4		
	Shallnot	13.0	35.5		
Rainbow Tr	Gull	21.3	35.1	51.1	Crossman (1973)
	Pyramid L., B.C.	6.1	13.5	19.0	
	Kootenay L., B.C.	6.2	12.5	28.9	
	Butte L., Vanc. Is. B.C.	—	25.4	26.7	

Table 6. Angler place of origin.

Lake	Year	# anglers		Man.	Sask.	Can.	U.S.A.	Other	Unknown
Two Mile	05/80-04/81	580		498	61	5	8	3	5
			%	85.86	10.52	0.86	1.38	0.52	0.86
	05/81-04/82	513		357	53	4	5	0	94
			%	69.59	10.33	0.78	0.97	0.00	18.32
Gull	01/79-12/79	401		239	146	9	3	2	2
			%	59.60	36.41	2.24	0.75	0.50	0.50
	05/80-04/81	660		371	235	5	3	0	46
			%	56.21	35.61	0.76	0.45	0.00	6.97
	05/81-04/82	1070		714	330	0	3	0	23
			%	66.73	30.84	0.00	0.28	0.00	2.15
East Blue	01/79-12/79	843		567	240	8	5	4	19
			%	67.26	28.47	0.95	0.59	0.47	2.25
	05/80-04/81	724		471	217	18	16	0	2
			%	65.06	29.97	2.49	2.21	0.00	0.28
	05/81-04/82	1381		937	333	13	30	5	63
			%	67.85	24.11	0.94	2.17	0.36	4.56
Childs	01/79-12/79	883		555	322	3	3		
			%	62.85	26.47	0.34	0.34		
Laurie	01/79-12/79	331		243	87	0	1		
			%	73.41	26.28	0.00	0.30		
All		7386		4952	2024	65	77	14	254
			%	67.05	27.40	0.88	1.04	0.19	3.44

Table 7. Hypothetical predation by loons on trout in Perch Lake, 1982.

Month	Number of days adults present	Mean number of birds/day	Number of trout eaten
May	19	1.00	57
June	30	1.75	158
July	31	2.25	209
August	31	2.00	186
September	11	0.63	21
		Total	631

*Estimate of each adult loon eating three (3) trout per day.

Table 8. Species growth by year stocked for yearlings and two year olds.

Lake	Species	Age	Year	Stocking rate (#/ha)	Sample size	Mean L (cm)	Mean W (g)
Two Mile	Brook Tr	1+	1980	220.2	5	25.6	158
		1+	1981	118.8	8	28.6	225
		2+	1980	112.3	12	30.2	310
		2+	1980	95.0	11	30.2	318
East Blue		1+	1979	44.4	2	33.3	615
Gull		1+	1979	51.5	4	25.7	278
East Blue	Rainbow Tr	1+	1979	44.4	9	41.6	950
		1+	1980	177.4	14	23.8	284
		1+	1981	55.4	8	18.4	88
		2+	1981	66.5	2	36.4	750
Gull		1+	1979	51.5	15	47.7	1555
		1+	1980	154.4	6	27.1	267
		1+	1981	42.9	12	23.0	208
		2+	1981	69.0	32	32.2	429
East Blue	Splake	1+	1981	127.5	19	25.7	203
Gull		1+	1981	85.8	5	25.8	190

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Appendix I

EAST BLUE rainbow 1979

stratum	#fish	std error	a-h	no. a-h
may wd + jun wd	889	251.0	2773	0.32
may we + jun we	378	116.5	3354	0.11
jul wd + aug wd + sep wd	381	111.4	6361	0.06
jul we + aug we + sep we	300	112.1	3605	0.08
oct wd + nov wd	13	11.5	357	0.04
oct we + nov we	37	24.5	458	0.08
dec wd	3	2.2	122	0.02
dec we	3	2.4	140	0.02
jan wd	0	0.0	61	0.00
jan we	6	2.4	311	0.02
feb wd + mar wd + apr wd	65	33.0	501	0.13
feb we + mar we + apr we	60	22.6	506	0.12
total	2134	323.0	18548	0.12

EAST BLUE brook 1979

stratum	#fish	std error	a-h	no. a-h
may wd + jun wd	0	0.0	2773	0.00
may we + jun we	0	0.0	3354	0.00
jul wd + aug wd + sep wd	18	16.7	6361	0.00
jul we + aug we + sep we	0	0.0	3605	0.00
oct wd + nov wd	0	0.0	357	0.00
oct we + nov we	0	0.0	458	0.00
dec wd	0	0.0	122	0.00
dec we	0	0.0	140	0.00
jan wd	0	0.0	61	0.00
jan we	0	0.0	311	0.00
feb wd + mar wd + apr wd	0	0.0	501	0.00
feb we + mar we + apr we	4	3.5	506	0.01
total	22	17.0	18548	0.00

EAST BLUE spLake 1979

stratum	#fish	std error	a-h	no./a-h
may wd	0	0.0	2773	0.00
+ jun wd				
may we	4	3.1	3354	0.00
+ jun we				
jul wd	0	0.0	6361	0.00
+ aug wd				
+ sep wd				
jul we	0	0.0	3605	0.00
+ aug we				
+ sep we				
oct wd	0	0.0	357	0.00
+ nov wd				
oct we	0	0.0	456	0.00
+ nov we				
dec wd	0	0.0	122	0.00
dec we	0	0.0	140	0.00
jan wd	0	0.0	61	0.00
jan we	0	0.0	311	0.00
feb wd	0	0.0	501	0.00
+ mar wd				
+ apr wd				
feb we	4	3.5	506	0.01
+ mar we				
+ apr we				
total	8	4.7	18548	0.00

EAST BLUE lake 1979

stratum	#fish	std error	a-h	no./a-h
may wd	58	54.9	2773	0.02
+ jun wd				
may we	77	46.9	3354	0.02
+ jun we				
jul wd	97	37.9	6361	0.02
+ aug wd				
+ sep wd				
jul we	30	17.8	3605	0.01
+ aug we				
+ sep we				
oct wd	31	14.5	357	0.09
+ nov wd				
oct we	3	2.9	456	0.01
+ nov we				
dec wd	3	2.2	122	0.02
dec we	3	2.4	140	0.02
jan wd	0	0.0	61	0.00
jan we	24	9.8	311	0.08
feb wd	24	21.5	501	0.05
+ mar wd				
+ apr wd				
feb we	8	4.4	506	0.02
+ mar we				
+ apr we				
total	359	88.0	18548	0.02

EAST BLUE brown 1979

stratum	#fish	std error	a-h	no./a-h
may wd + jun wd	0	0.0	2773	0.00
may we + jun we	4	3.1	3354	0.00
jul wd + aug wd + sep wd	35	35.4	6361	0.01
jul we + aug we + sep we	0	0.0	3605	0.00
oct wd + nov wd	31	28.8	357	0.09
oct we + nov we	0	0.0	458	0.00
dec wd	5	2.2	122	0.04
dec we	0	0.0	146	0.00
jan wd	0	0.0	61	0.00
jan we	0	0.0	311	0.00
feb wd + mar wd + apr wd	0	0.0	501	0.00
feb we + mar we + apr we	4	3.5	508	0.01
total	80	44.4	18548	0.00

EAST BLUE 1980 rainbow

stratum	#fish	std error	e-h	no./e-h
may wd + jun wd + mar wd	70	40.5	1328	0.05
may we + jun we	81	38.9	1376	0.06
jul wd + aug wd + sep wd	201	79.5	4622	0.04
jul we + aug we + sep we	74	14.1	3366	0.02
oct wd + nov wd	11	10.0	247	0.04
oct we + nov we	57	48.9	675	0.08
dec wd	0	0.0	128	0.00
dec we	0	0.0	171	0.00
jan wd	0	0.0	34	0.00
jan we	0	0.0	298	0.00
feb wd + apr wd	0	0.0	110	0.00
feb we + mar we + apr we	0	0.0	111	0.00
total	493	110.3	12466	0.04

EAST BLUE 1980 brook

stratum	#fish	std error	e-h	no./e-h
may wd + jun wd + mar wd	31	17.8	1328	0.02
may we + jun we	24	13.3	1376	0.02
jul wd + aug wd + sep wd	9	8.6	4622	0.00
jul we + aug we + sep we	11	6.2	3366	0.00
oct wd + nov wd	0	0.0	247	0.00
oct we + nov we	8	4.0	675	0.01
dec wd	0	0.0	128	0.00
dec we	0	0.0	171	0.00
jan wd	0	0.0	34	0.00
jan we	0	0.0	298	0.00
feb wd + apr wd	0	0.0	110	0.00
feb we + mar we + apr we	0	0.0	111	0.00
total	82	25.0	12466	0.01

EAST BLUE 1980 splake

stratum	#fish	std error	a-h	no./a-h
may wd	0	0.0	1328	0.00
+ jun wd				
+ mar wd				
may we	0	0.0	1376	0.00
+ jun we				
jul wd	9	8.6	4622	0.00
+ aug wd				
+ sep wd				
jul we	0	0.0	3366	0.00
+ aug we				
+ sep we				
oct wd	0	0.0	247	0.00
+ nov wd				
oct we	0	0.0	675	0.00
+ nov we				
dec wd	0	0.0	128	0.00
dec we	0	0.0	171	0.00
jan wd	0	0.0	34	0.00
jan we	0	0.0	298	0.00
feb wd	0	0.0	110	0.00
+ apr wd				
feb we	0	0.0	111	0.00
+ mar we				
+ apr we				
total	9	8.6	12466	0.00

EAST BLUE 1980 lake

stratum	#fish	std error	a-h	no./a-h
may wd	8	7.3	1328	0.01
+ jun wd				
+ mar wd				
may we	9	2.4	1376	0.01
+ jun we				
jul wd	91	49.1	4622	0.02
+ aug wd				
+ sep wd				
jul we	28	8.9	3366	0.01
+ aug we				
+ sep we				
oct wd	0	0.0	247	0.00
+ nov wd				
oct we	11	6.5	675	0.02
+ nov we				
dec wd	7	6.5	128	0.05
dec we	10	8.9	171	0.06
jan wd	0	0.0	34	0.00
jan we	0	0.0	298	0.00
feb wd	0	0.0	110	0.00
+ apr wd				
feb we	0	0.0	111	0.00
+ mar we				
+ apr we				
total	165	52.1	12466	0.01

EAST BLUE 1980 brown

stratum	#fish	std error	a-h	no./a-h
may wd + jun wd + mar wd	47	43.7	1328	0.04
may we + jun we	51	26.0	1376	0.04
jul wd + aug wd + sep wd	201	97.2	4622	0.04
jul we + aug we + sep we	32	13.7	3366	0.01
oct wd + nov wd	11	10.0	247	0.04
oct we + nov we	27	19.0	675	0.04
dec wd	0	0.0	126	0.00
dec we	0	0.0	171	0.00
jan wd	0	0.0	34	0.00
jan we	0	0.0	298	0.00
feb wd + apr wd	0	0.0	110	0.00
feb we + mar we + apr we	0	0.0	111	0.00
total	368	112.7	12466	0.03

EAST BLUE 1981 rainbow

stratum	#fish	std error	a-h	no./a-h
may wd + jun wd	186	121.5	3463	0.05
may we + jun we	358	152.1	3809	0.09
jul wd + aug wd + sep wd	525	161.8	4779	0.11
jul we + aug we + sep we	381	110.0	4963	0.08
oct wd + nov wd	10	9.7	123	0.08
oct we + nov we	76	46.0	383	0.20
dec wd	0	0.0	264	0.00
dec we	9	7.9	334	0.03
jan wd	0	0.0	0	0.00
jan we	0	0.0	17	0.00
feb wd + mar wd + apr wd	9	8.5	696	0.01
feb we + mar we + apr we	175	74.1	857	0.20
total	1729	289.6	19688	0.09

EAST BLUE 1981 brook

stratum	#fish	std error	a-h	no./a-h
may wd + jun wd	12	7.1	3463	0.00
may we + jun we	3	2.6	3809	0.00
jul wd + aug wd + sep wd	0	0.0	4779	0.00
jul we + aug we + sep we	8	4.7	4963	0.00
oct wd + nov wd	0	0.0	123	0.00
oct we + nov we	4	3.5	383	0.01
dec wd	0	0.0	264	0.00
dec we	0	0.0	334	0.00
jan wd	0	0.0	0	0.00
jan we	0	0.0	17	0.00
feb wd + mar wd + apr wd	0	0.0	696	0.00
feb we + mar we + apr we	0	0.0	857	0.00
total	27	9.5	19688	0.00

EAST BLUE 1981 splake

stratum	#fish	std error	a-h	no./a-h
may ud	0	0.0	3463	0.00
+ jun ud may ue	3	2.6	3889	0.00
+ jun ue jul ud + aug ud + sep ud	0	0.0	4779	0.00
jul ue + aug ue + sep ue	8	7.2	4963	0.00
oct ud + nov ud	0	0.0	123	0.00
oct ue + nov ue	0	0.0	383	0.00
dec ud	55	52.4	264	0.21
dec ue	45	23.8	334	0.13
jan ud	0	0.0	0	0.00
jan ue	0	0.0	17	0.00
feb ud + mar ud + apr ud	10	17.8	698	0.03
feb ue + mar ue + apr ue	71	39.0	857	0.08
total	200	72.0	19688	0.01

EAST BLUE 1981 lake

stratum	#fish	std error	a-h	no./a-h
may ud	18	11.4	3463	0.01
+ jun ud may ue	16	4.8	3889	0.00
+ jun ue jul ud + aug ud + sep ud	28	17.1	4779	0.01
jul ue + aug ue + sep ue	21	9.1	4963	0.00
oct ud + nov ud	0	0.0	123	0.00
oct ue + nov ue	0	0.0	383	0.00
dec ud	0	0.0	264	0.00
dec ue	0	0.0	334	0.00
jan ud	0	0.0	0	0.00
jan ue	0	0.0	17	0.00
feb ud + mar ud + apr ud	0	0.0	698	0.00
feb ue + mar ue + apr ue	0	0.0	857	0.00
total	83	23.0	19688	0.00

EAST BLUE 1981 brown

stratum	#fish	std error	a-h	no./a-h
may wd + jun wd	30	11.0	3463	0.01
may we + jun we	41	12.5	3809	0.01
jul wd + aug wd + sep wd	7	6.5	4779	0.00
jul we + aug we + sep we	12	10.9	4963	0.00
oct wd + nov wd	0	0.0	12[illegible]	0.00
oct we + nov we	12	6.9	383	0.03
dec wd	0	0.0	264	0.00
dec we	0	0.0	334	0.00
jan wd	0	0.0	0	0.00
jan we	0	0.0	17	0.00
feb wd + mar wd + apr wd	0	0.0	698	0.00
feb we + mar we + apr we	0	0.0	857	0.00
total	103	22.0	19688	0.01

East Blue 1982 rainbow

stratum	#fish	std error	a-h	no./a-h
may wd + jun wd	224	89.0	3714	0.06
may we + jun we	147	52.2	2139	0.07
jul wd + aug wd	116	16.4	5515	0.02
jul we + aug we	109	69.8	2483	0.04
total	596	126.0	13850	0.04

East Blue 1982 brook

stratum	#fish	std error	a-h	no./a-h
may wd + jun wd	0	0.0	3714	0.00
may we + jun we	0	0.0	2139	0.00
jul wd + aug wd	0	0.0	5515	0.00
jul we + aug we	0	0.0	2483	0.00
total	0	0.0	13850	0.00

East Blue 1982 splake

stratum	#fish	std error	a-h	no./a-h
may wd + jun wd	119	54.5	3714	0.03
may we + jun we	71	41.0	2139	0.03
jul wd + aug wd	11	10.0	5515	0.00
jul we + aug we	29	11.0	2483	0.01
total	230	69.8	13850	0.02

East Blue 1982 lake

stratum	#fish	std error	a-h	no./a-h
may wd + jun wd	35	21.1	3714	0.01
may we + jun we	19	11.9	2139	0.01
jul wd + aug wd	0	0.0	5515	0.00
jul we + aug we	7	6.7	2483	0.00
total	61	25.2	13850	0.00

East Blue 1982 brown

stratum	#fish	std error	a-h	no./a-h
may wd + jun wd	7	6.5	3714	0.00
may we + jun we	5	4.2	2139	0.00
jul wd + aug wd	0	0.0	5515	0.00
jul we + aug we	0	0.0	2483	0.00
total	12	7.7	13850	0.00

Appendix II

GULL rainbow 1979

stratum	#fish	std error	a-h	no./a-h
may ud + jun ud	116	69.1	696	0.17
may we + jun we	29	3.1	848	0.03
jul ud + aug ud + sep ud	124	67.8	2051	0.06
jul we + aug we + sep we	175	27.2	2439	0.07
oct ud + nov ud	57	36.0	576	0.10
oct we + nov we	23	15.7	721	0.03
dec ud	7	5.4	50	0.14
dec we	8	1.8	243	0.03
jan ud	0	0.0	208	0.00
jan we	3	2.4	174	0.02
feb ud + mar ud + apr ud	5	4.8	270	0.02
feb we + mar we + apr we	34	18.6	125	0.27
total	581	109.9	8400	0.07

GULL brook 1979

stratum	#fish	std error	a-h	no./a-h
may ud + jun ud	0	0.0	696	0.00
may we + jun we	0	0.0	848	0.00
jul ud + aug ud + sep ud	99	58.2	2051	0.05
jul we + aug we + sep we	50	29.9	2439	0.02
oct ud + nov ud	75	44.6	576	0.13
oct we + nov we	88	28.3	721	0.12
dec ud	2	1.8	50	0.05
dec we	38	20.8	243	0.16
jan ud	0	0.0	208	0.00
jan we	0	0.0	174	0.00
feb ud + mar ud + apr ud	0	0.0	270	0.00
feb we + mar we + apr we	0	0.0	125	0.00
total	353	86.7	8400	0.04

GULL splake 1979

stratum	#fish	std error	a-h	no./a-h
may wd + jun wd	10	9.2	696	0.01
may we + jun we	0	0.0	848	0.00
jul wd + aug wd + sep wd	0	0.0	2051	0.00
jul we + aug we + sep we	50	26.5	2439	0.02
oct wd + nov wd	13	7.4	576	0.02
oct we + nov we	3	2.3	721	0.00
dec wd	0	0.0	50	0.00
dec we	2	1.4	243	0.01
jan wd	6	5.0	208	0.03
jan we	0	0.0	174	0.00
feb wd + mar wd + apr wd	0	0.0	270	0.00
feb we + mar we + apr we	0	0.0	125	0.00
total	83	29.6	8400	0.01

GULL kokanee 1979

stratum	#fish	std error	a-h	no./a-h
may wd + jun wd	174	125.8	696	0.25
may we + jun we	158	90.2	848	0.19
jul wd + aug wd + sep wd	136	84.9	2051	0.07
jul we + aug we + sep we	285	106.2	2439	0.12
oct wd + nov wd	6	5.8	576	0.01
oct we + nov we	6	4.6	721	0.01
dec wd	67	33.1	50	1.33
dec we	594	257.2	243	2.45
jan wd	440	398.0	208	2.12
jan we	360	66.3	174	2.07
feb wd + mar wd + apr wd	117	70.4	270	0.43
feb we + mar we + apr we	19	17.1	125	0.15
total	2361	527.0	8400	0.28

GULL 1980 rainbow

stratum	#fish	std error	a-h	no./a-h
may wd	26	8.0	600	0.04
+ jun wd				
may we	84	37.5	1583	0.05
+ jun we				
jul wd	32	10.0	984	0.03
+ aug wd				
+ sep wd				
jul we	59	17.0	2643	0.02
+ aug we				
+ sep we				
oct wd	21	11.5	1667	0.01
+ nov wd				
oct we	23	9.5	1045	0.02
+ nov we				
dec wd	11	10.0	1008	0.01
dec we	17	7.4	637	0.03
jan wd	28	13.0	643	0.04
jan we	23	2.8	663	0.04
feb wd	50	18.5	1109	0.04
+ mar wd				
+ apr wd				
feb we	24	5.7	1000	0.02
+ mar we				
+ apr we				
total	397	54.2	13582	0.03

GULL 1980 brook

stratum	#fish	std error	a-h	no./a-h
may wd	60	24.0	600	0.10
+ jun wd				
may we	448	220.2	1583	0.28
+ jun we				
jul wd	72	39.9	984	0.07
+ aug wd				
+ sep wd				
jul we	271	88.2	2643	0.10
+ aug we				
+ sep we				
oct wd	168	90.8	1667	0.10
+ nov wd				
oct we	61	22.7	1045	0.06
+ nov we				
dec wd	42	39.9	1008	0.04
dec we	63	19.5	637	0.10
jan wd	21	11.2	643	0.03
jan we	63	7.4	663	0.10
feb wd	81	44.8	1109	0.07
+ mar wd				
+ apr wd				
feb we	24	10.0	1000	0.02
+ mar we				
+ apr we				
total	1373	267.3	13562	0.10

GULL 1980 splake

stratum	#fish	std error	a-h	no. o-h
may wd + jun wd	9	8.0	600	0.01
may we + jun we	12	10.4	1583	0.01
jul wd + aug wd + sep wd	24	15.7	984	0.02
jul we + aug we + sep we	87	49.0	2643	0.03
oct wd + nov wd	105	41.6	1667	0.06
oct we + nov we	91	25.5	1045	0.09
dec wd	53	47.9	1008	0.05
dec we	87	35.6	627	0.14
jan wd	14	6.5	643	0.02
jan we	17	2.8	663	0.03
feb wd + mar wd + apr wd	68	33.3	1109	0.06
feb we + mar we + apr we	18	7.3	1000	0.02
total	584	100.8	13582	0.04

GULL 1980 kokanee

stratum	#fish	std error	a-h	no. o-h
may wd + jun wd	0	0.0	600	0.00
may we + jun we	0	0.0	1583	0.00
jul wd + aug wd + sep wd	0	0.0	984	0.00
jul we + aug we + sep we	12	4.1	2643	0.00
oct wd + nov wd	0	0.0	1667	0.00
oct we + nov we	4	3.3	1045	0.00
dec wd	21	20.9	1008	0.02
dec we	7	2.8	627	0.01
jan wd	7	6.5	643	0.01
jan we	3	2.8	663	0.01
feb wd + mar wd + apr wd	0	0.0	1109	0.00
feb we + mar we + apr we	0	0.0	1000	0.00
total	54	22.0	13582	0.00

GULL 1981 splake

stratum	#fish	std error	o-h	no./o-h
may ud + jun ud	30	11.0	1491	0.02
may we + jun we	44	20.2	2892	0.02
jul ud + aug ud + sep ud	181	92.0	2414	0.08
jul we + aug we + sep we	224	113.5	2617	0.09
oct ud + nov ud	472	200.2	1071	0.44
oct we + nov we	376	164.5	1880	0.20
dec ud	198	92.2	721	0.27
dec we	396	64.2	1483	0.27
jan ud	250	104.4	848	0.29
jan we	66	42.3	834	0.08
feb ud + mar ud + apr ud	315	129.6	2540	0.12
feb we + mar we + apr we	215	60.5	2672	0.08
total	2766	368.5	21462	0.13

GULL 1981 kokanee

stratum	#fish	std error	o-h	no./o-h
may ud + jun ud	0	0.0	1491	0.00
may we + jun we	3	2.6	2892	0.00
jul ud + aug ud + sep ud	0	0.0	2414	0.00
jul we + aug we + sep we	0	0.0	2617	0.00
oct ud + nov ud	0	0.0	1071	0.00
oct we + nov we	4	3.5	1880	0.00
dec ud	0	0.0	721	0.00
dec we	0	0.0	1483	0.00
jan ud	10	9.5	848	0.01
jan we	0	0.0	834	0.00
feb ud + mar ud + apr ud	0	0.0	2540	0.00
feb we + mar we + apr we	0	0.0	2672	0.00
total	17	10.4	21462	0.00

GULL 1980 splake

stratum	#fish	std error	a-h	no./a-h
may wd + jun wd	9	8.0	680	0.01
may we + jun we	12	10.4	1583	0.01
jul wd + aug wd + sep wd	24	15.7	984	0.02
jul we + aug we + sep we	87	49.0	2643	0.03
oct wd + nov wd	105	41.6	1667	0.06
oct we + nov we	91	25.5	1045	0.09
dec wd	53	49.9	1008	0.05
dec we	87	35.6	637	0.14
jan wd	14	6.5	643	0.02
jan we	17	2.8	663	0.03
feb wd + mar wd + apr wd	68	33.3	1109	0.06
feb we + mar we + apr we	18	7.3	1000	0.02
total	584	180.8	13582	0.04

GULL 1980 kokanee

stratum	#fish	std error	a-h	no./a-h
may wd + jun wd	0	0.0	680	0.00
may we + jun we	0	0.0	1583	0.00
jul wd + aug wd + sep wd	0	0.0	984	0.00
jul we + aug we + sep we	12	4.1	2643	0.00
oct wd + nov wd	0	0.0	1667	0.00
oct we + nov we	4	3.3	1045	0.00
dec wd	21	20.0	1008	0.02
dec we	7	2.8	637	0.01
jan wd	7	6.5	643	0.01
jan we	3	2.3	663	0.01
feb wd + mar wd + apr wd	0	0.0	1109	0.00
feb we + mar we + apr we	0	0.0	1000	0.00
total	54	22.0	13582	0.00

GULL 1981 rainbow

stratum	#fish	std error	a-h	no./a-h
may wd + jun wd	60	31.1	1491	0.04
may we + jun we	101	26.8	2892	0.04
jul wd + aug wd + sep wd	748	296.7	2414	0.31
jul we + aug we + sep we	837	177.0	2617	0.32
oct wd + nov wd	349	216.0	1071	0.33
oct we + nov we	312	150.5	1880	0.17
dec wd	73	49.1	721	0.10
dec we	141	40.3	1483	0.10
jan wd	180	19.0	848	0.21
jan we	73	44.1	834	0.09
feb wd + mar wd + apr wd	360	132.6	2540	0.14
feb we + mar we + apr we	319	72.0	2672	0.12
total	3545	464.7	21462	0.17

GULL 1981 brook

stratum	#fish	std error	a-h	no./a-h
may wd + jun wd	72	20.0	1491	0.05
may we + jun we	149	67.6	2892	0.05
jul wd + aug wd + sep wd	0	0.0	2414	0.00
jul we + aug we + sep we	0	0.0	2617	0.00
oct wd + nov wd	10	9.7	1071	0.01
oct we + nov we	12	6.9	1880	0.01
dec wd	15	6.8	721	0.02
dec we	27	8.5	1483	0.02
jan wd	10	9.5	848	0.01
jan we	4	3.1	834	0.00
feb wd + mar wd + apr wd	0	0.0	2540	0.00
feb we + mar we + apr we	7	3.5	2672	0.00
total	305	73.1	21462	0.01

GULL 1981 splake

stratum	#fish	std error	a-h	no./a-h
may wd + jun wd	30	11.0	1491	0.02
may we + jun we	44	20.2	2892	0.02
jul wd + aug wd + sep wd	181	92.0	2414	0.08
jul we + aug we + sep we	224	113.5	2617	0.09
oct wd + nov wd	472	200.2	1071	0.44
oct we + nov we	376	164.5	1880	0.20
dec wd	198	92.4	721	0.27
dec we	396	64.2	1483	0.27
jan wd	250	104.4	848	0.29
jan we	66	42.3	834	0.08
feb wd + mar wd + apr wd	315	124.6	2540	0.12
feb we + mar we + apr we	215	68.5	2672	0.08
total	2766	368.5	21462	0.13

GULL 1981 kokanee

stratum	#fish	std error	a-h	no./a-h
may wd + jun wd	0	0.0	1491	0.00
may we + jun we	3	3.6	2892	0.00
jul wd + aug wd + sep wd	0	0.0	2414	0.00
jul we + aug we + sep we	0	0.0	2617	0.00
oct wd + nov wd	0	0.0	1071	0.00
oct we + nov we	4	3.5	1880	0.00
dec wd	0	0.0	721	0.00
dec we	0	0.0	1483	0.00
jan wd	10	9.5	848	0.01
jan we	0	0.0	834	0.00
feb wd + mar wd + apr wd	0	0.0	2540	0.00
feb we + mar we + apr we	0	0.0	2672	0.00
total	17	10.4	21462	0.00

Appendix III

TWO MILE 1980 brook

stratum	#fish	std error	a-h	no./a-h
may wd + jun wd	0	0.0	65	0.00
jul wd + aug wd + sep wd	408	103.0	964	0.42
jul we + aug we + sep we	1058	219.2	2124	0.50
oct wd + nov wd	748	237.3	1537	0.49
oct we + nov we	301	154.6	956	0.31
dec wd	49	45.4	394	0.12
dec we	47	2.8	138	0.34
jan wd	63	20.0	436	0.14
jan we	50	14.5	248	0.20
feb wd + mar wd + apr wd	115	72.6	385	0.30
feb we + mar we + apr we	118	45.5	387	0.31
total	2956	385.9	7634	0.39

TWO MILE 1981 brook

stratum	#fish	std error	a-h	no./a-h
may wd + jun wd	264	81.0	953	0.28
may we + jun we	193	62.5	674	0.29
jul wd + aug wd + sep wd	280	132.3	1461	0.19
jul we + aug we + sep we	497	125.0	1217	0.41
oct wd + nov wd	92	33.3	697	0.13
oct we + nov we	384	133.9	614	0.63
dec wd	88	61.3	471	0.19
dec we	117	47.6	315	0.37
jan wd	0	0.0	50	0.00
jan we	6	5.0	12	0.44
feb wd + mar wd + apr wd	216	152.7	351	0.62
feb we + mar we + apr we	41	17.4	289	0.14
total	2178	303.8	7104	0.31

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